An environmental assessment activity to promote active distance learning and challenge of personal lifestyles and values

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An environmental assessment activity to promote active distance learning and challenge of personal lifestyles and values

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Abstract
This paper introduces a new distance learning course, *'Working with our Environment: Technology for a Sustainable Future'*. An inter-disciplinary team within the Technology Faculty of the Open University developed this undergraduate course, which enrols over 1500 students per year. One of the overall course aims is to help students understand how the use of technology to meet human material needs contributes to environmental effects. The process of producing this course, its philosophy, aims and design will be briefly discussed.

At the start of the course a lifestyle environmental assessment activity, called EcoCal, is integrated within students' study materials. The activity enables students to assess the main impacts on the environment arising from their own household's consumption of energy, transport, food and water and production of waste. Through the use, either of a printed questionnaire or publicly available software, students can calculate their 'Ecological Footprint' and then consider and model the effects of changes to their lifestyle. Through the combination of undertaking this activity and submitting an appropriate assignment, students are encouraged to think critically and creatively about their impacts on the environment and how these might be reduced at both individual and societal levels. At the end of the course students were surveyed to explore whether their attitudes and behaviour had changed.

Introduction

Supported distance learning through the Open University enables large numbers of English speaking students in the United Kingdom and Europe to participate in Higher Education. The Technology Faculty within the Open University provides courses that cover a wide range of subjects including the areas of Environmental Technology and Management, Systems, Global Development, Design and Innovation and Engineering. An introductory course at undergraduate level, such as *'Working with our Environment: Technology for a Sustainable Future'* which is the subject of this paper, has to be open to all students regardless of their previous educational background. With an open entry policy it has to provide an introduction to distance learning as well as introducing the necessary study skills and understanding of concepts needed for higher level study.

The course was designed to appeal to students from any background who are interested in learning how to shape a sustainable future. It offers a broad interdisciplinary introduction to the technical, human and social aspects of environmental issues, from local air pollution to global climate change.

The overall aims of the course are to help students understand:

1. (a) how the use of technology to meet human needs contributes to environmental effects, and (b) how technology may be used to protect the environment.

2. how technology may be employed to design products, processes and systems that contribute to the development of an environmentally sustainable future

Course Production
Within the Open University courses are developed using a course team model.
Academics on this course team represented the disciplines of Design and Innovation, Systems, Development, Environmental Engineering and the Energy & Environment Research Unit. There were also academics who consider the presentation of the courses, the selection, appointment and development of tutors and the development of students' study skills. Other personnel within the University, such as editors and specialists from Graphic Design, Production, Purchasing and educational software, are also used as appropriate throughout the production.

Regular meetings of the course team, and exchanges using a course team computer conference, identified and resolved a number of issues surrounding access to the course and the underlying pedagogy. In an attempt to keep the course as open as possible it was decided at the beginning of the discussions to offer a computing and a non-computing route through the course materials. The course team acknowledged the need to develop information handling and critical reading skills by adopting a resource-based approach for parts of the course. This resource based learning uses diverse sources to make students active learners and has the following benefits:

- makes provision for individual student backgrounds;
- allows students to have some control over their rate of study and route through a particular course;
- offers a wider range of print and non-print resources to motivate interest;
- promotes acquisition of research, search and select skills.

There was also a deliberate progression through the four Themes of the course (detailed below) from consideration of personal and household lifestyles and their implications for the environment to a broader consideration of the global implications of technological and economic development. The course is presented as a series of four main Themes and three resource Files, together with an Introduction and Conclusion. The themes are:

You and the environment
How individuals and households affect the environment and how home energy consumption might be reduced. This is based on two activities. The first enables you to assess the impact of your household (or another suitable one) on the environment and consider how to reduce it. The second assesses the energy efficiency of your home and how its energy consumption could be reduced. The theme also considers the extent to which environmental problems can be tackled at a personal or household level.

Travelling light
The effects of personal transport on the environment. This Theme considers how the transport system in European countries could be made sustainable through a combination of future technical, behavioural and social changes. You will consider your own transport patterns and how they might become more sustainable.

Food chains
The relationship between the food purchasing decisions of individual consumers and the sustainability of the food supply in Europe and in the world. You will consider your diet and its implications for your health, the food supply system and the environment, and learn to read critically articles about controversial issues such as the role of genetically modified crops in the food supply.

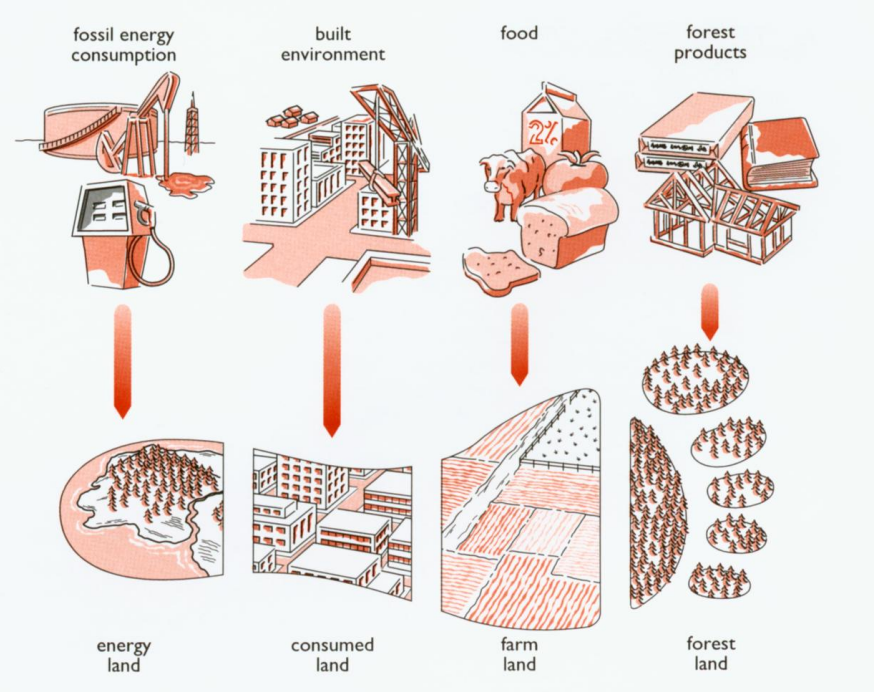
Thinking globally
The implications for the environment of today's highly interconnected world. For example, you will examine the environmental and other issues raised by developing countries' assertion of their 'right to development'.

Throughout the course there was recognition of the need to use an interdisciplinary approach. This follows directly from the interdisciplinary nature of environmental problems (Foster, 1998). But, as with any interdisciplinary team, there were certain challenges and conflicts within the team as well as opportunities for group learning and lively discussions of concepts, values and lifestyles. Two of the authors were used to open up the values associated with particular lifestyles and there was discussion within the course material of these two authors described as 'environmentally sanctimonious Gordon' and 'environmentally slack Tom'. A third character, who lived in a developing country was introduced within the material of the fourth theme as 'environmentally dependent Afi'. It was during the preparation of this last theme of the course, *Thinking globally*, where some tensions within the team began to emerge. Was the discussion of globalisation and development sufficiently 'technical' in a course about technology and the environment? The counter argument started from the premise that both technology and the environment cannot be separated from the social, political and cultural facets of life. Again as a result of team discussions these issues were opened up in the course material so that it was made explicit that the final 'product' represents an accommodation of different emphases and students were encouraged to engage critically with the content. In this way there is a recognition that 'the knowledge base of environmental higher education is problematic in its objectivity, truth and certainty and frequently subject to contestation' (Jones and Merritt, 1998).

Within the first Theme, the focus is strongly on the individual student and their immediate household. The importance of households for the environment is well established, where for example in the UK homes are responsible for nearly a third of energy delivered and a quarter of carbon dioxide emissions. For students to engage with this knowledge and consider their own context and values they are engaged in an activity using an ecological footprinting model called EcoCal.

The EcoCal Activity
The EcoCal activity is based on an environmental assessment technique called Ecological Footprinting. The Ecological Footprint of a household (or of a city or a country) is the total land area required to absorb its carbon dioxide emissions (the so-called 'energy land'), to accommodate buildings, roads, etc. (the 'consumed land'), and to provide food, water and forest products (the 'farm land' and 'forest land') for its members, as shown in Figure 1:

Figure 1. Converting consumption into land area. Summing the land requirement for all significant categories of consumption and waste estimates the Ecological Footprint for the reference population. (After Phil Testemale in Wackernagel and Rees, 1996, p.67.)



EcoCal calculates the 'footprint' that arises from a particular household's activities in Transport, Energy, Water, Shopping, House and Garden and Waste. It gives individual scores for each topic and a total household score in 'ecocals', where 1 ecocal is 100 m^2. EcoCal is available as either a computer program or a paper questionnaire and the computer version will run on a very basic machine running Windows 3.1 or above. Whichever version is chosen, the student needs to enter information about their household and lifestyle for each topic. For example if you look at the Transport screen (Figure 2), students are asked how much vehicle fuel is used by members of their household each week, how far they travel by bus and train, and so on. The data does not have to be very precise and guidance on answering each question is provided through a set of detailed EcoCal instructions. Having entered the data a student can compare their household's scores with those of typical UK households and to get some suggestions for reducing their footprint (Figure 3). For transport there are fairly obvious suggestions such as using trains, buses or cycling wherever possible. The aim of these suggestions is to encourage students to think of ways of reducing the environmental impact of their own household, perhaps discussing with others in the household and thinking creatively.

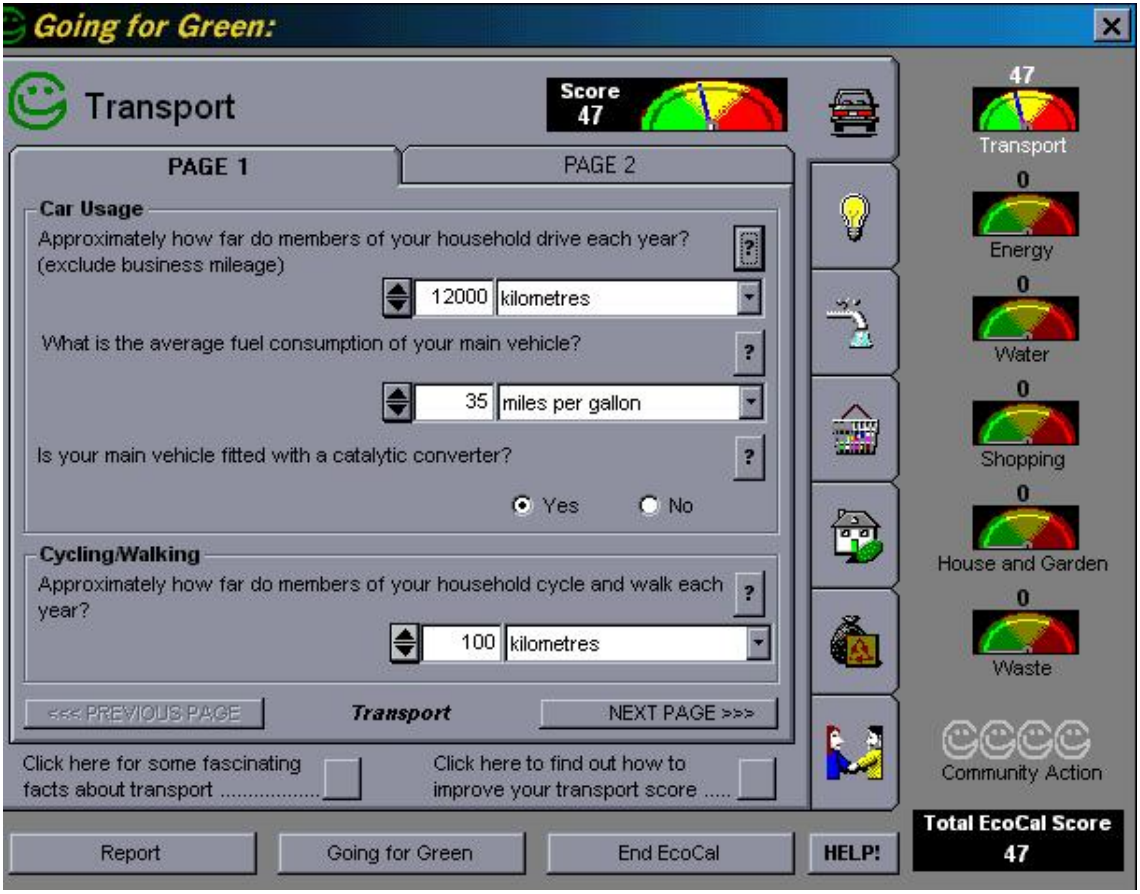
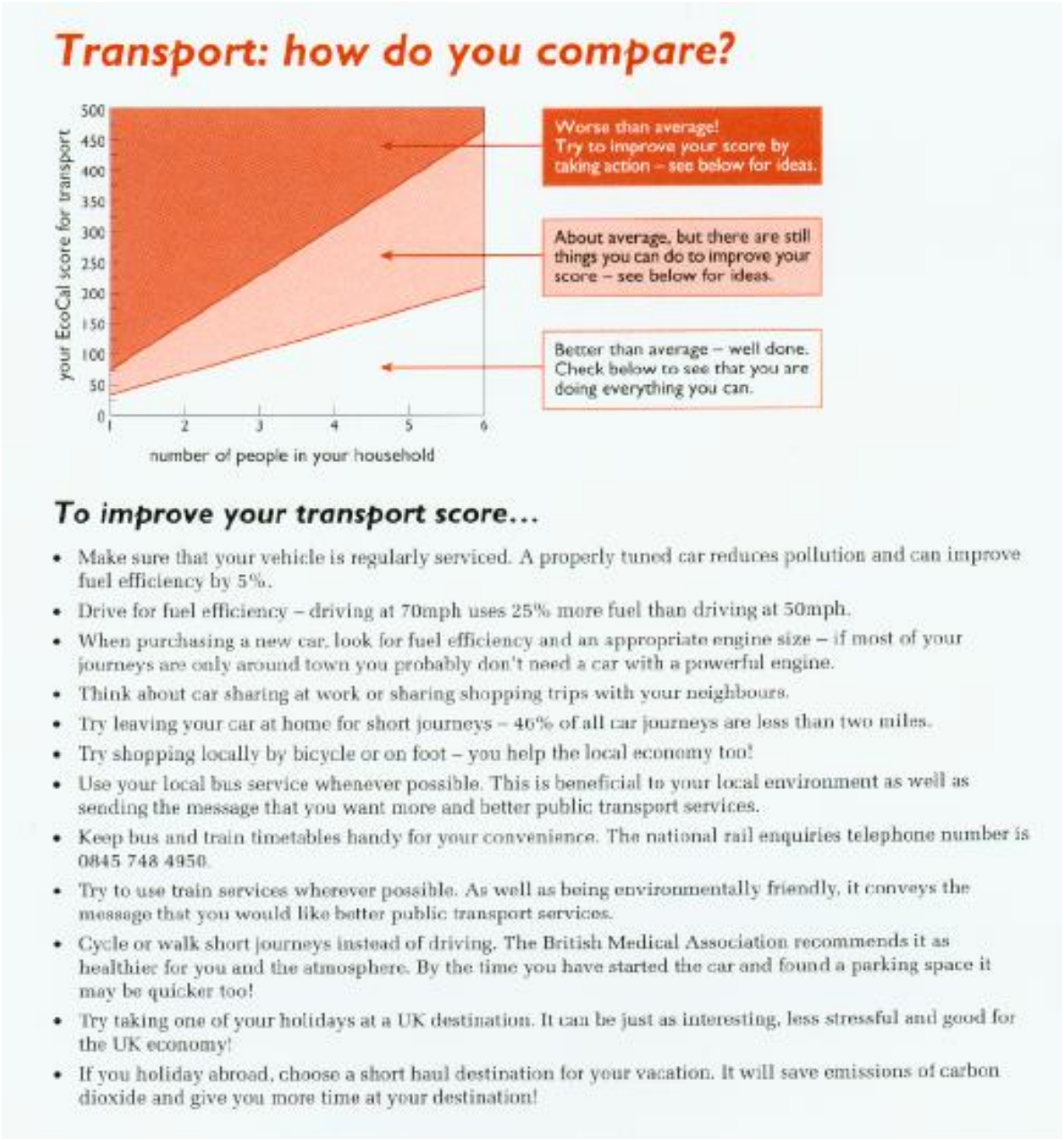


Figure 2. Data entry screen for Transport in the computer-based version of EcoCal.

Figure 3 Chart for comparing your household score for Transport with an average UK household of the same size. Plus some suggestions for reducing your household's score, all from the paper-based version of EcoCal.



Transport: how do you compare?

To improve your transport score...

- Make sure that your vehicle is regularly serviced. A properly tuned car reduces pollution and can improve fuel efficiency by 5%.
- Drive for fuel efficiency – driving at 70mph uses 25% more fuel than driving at 50mph.
- When purchasing a new car, look for fuel efficiency and an appropriate engine size – if most of your journeys are only around town you probably don't need a car with a powerful engine.
- Think about car sharing at work or sharing shopping trips with your neighbours.
- Try leaving your car at home for short journeys – 46% of all car journeys are less than two miles.
- Try shopping locally by bicycle or on foot – you help the local economy too!
- Use your local bus service whenever possible. This is beneficial to your local environment as well as sending the message that you want more and better public transport services.
- Keep bus and train timetables handy for your convenience. The national rail enquiries telephone number is 0845 748 4950.
- Try to use train services wherever possible. As well as being environmentally friendly, it conveys the message that you would like better public transport services.
- Cycle or walk short journeys instead of driving. The British Medical Association recommends it as healthier for you and the atmosphere. By the time you have started the car and found a parking space it may be quicker too!
- Try taking one of your holidays at a UK destination. It can be just as interesting, less stressful and good for the UK economy!
- If you holiday abroad, choose a short haul destination for your vacation. It will save emissions of carbon dioxide and give you more time at your destination!

Completion of the activity is directly connected to the assessment and one of the options within the first assignment for this course is to discuss their EcoCal ideas. Students are asked to write a report of about 1500 words outlining the changes that they considered to reduce their household's environmental impacts as a result of carrying out the EcoCal Activity.

EcoCal Results

In 2000 there were 1863 students at the start of the course in the UK and Europe. 1233 completed the first assignment and nearly 700 provided an EcoCal score sheet. 54% of the household sample had children and 25% had no children in residence (under 16 years old). For the total sample of 692 students the average household size was 2.9 persons (2.1 adults + 0.8 children), 77% were in urban/suburban locations as opposed to 23% in rural locations. The average Ecological Footprint was 3.34 ha per household, or 1.33 ha per person. These are comparable with figures produced in other studies, where for example a 1997 survey of 42 households in the United Kingdom reported in Simmons and Chambers (1998) gave an Ecological Footprint of 5 ha per household and 1.7 ha per adult (and 1.2 ha per person including children).

From a statistical analysis of the data (Roy and Caird, 2000) the contributions to the total household Ecological Footprint for the whole Open University student sample are in order of magnitude (taking averages per person) from Transport, Energy, House & garden, Shopping, Waste and Water. On average Transport and Energy account for nearly three-quarters of the total Ecological Footprint per person. However, the profile of per capita contributions from each activity does vary for households with and without children, as shown in Figure 4. For households *with* children, the contributions in descending order of importance are: Energy, Transport, House & garden, Waste, Shopping and Water. Whereas, for households *without* children, the contributions in descending order of importance are: Transport, Energy, Shopping, Waste, House & garden and Water. Most notably households without children had almost three times the Transport footprint per person (0.72 ha) as those with children (0.26 ha) and twice the Shopping footprint per person as those with children. Overall the average footprint per person for households without children is over 80% more than for those with children.

Figure 4 'Polluting profiles' for households with and without children.
Open University sample.

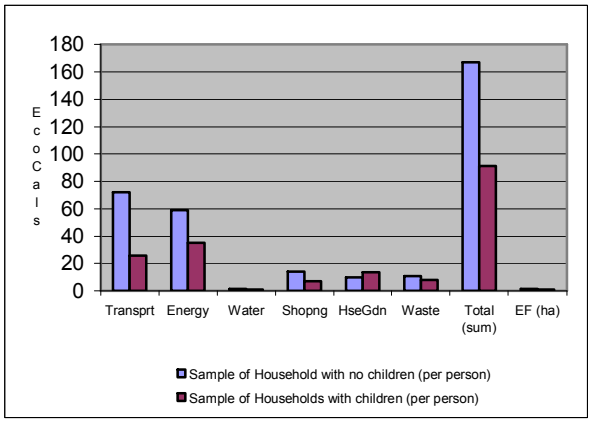
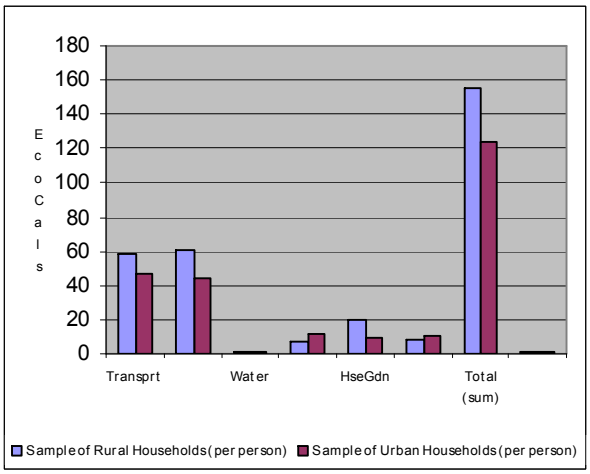


Figure 5 'Polluting profiles' for urban and rural households. Open University sample.



Urban households: Transport, Energy, **Shopping**, Waste, House & Garden, Water.
Rural households:
Energy, Transport, **House & Garden**, Waste, Shopping, Water.

Similarly there were differences in the profiles for urban and rural households, as shown in Figure 5. Perhaps not surprisingly, on average the rural households occupied more than twice the land per person to accommodate the House & garden (0.2 ha) as the urban households (0.09 ha).

Evaluation

It appears from the data that the Ecological Footprint per capita of the Open University student households is probably somewhat lower than the average for the UK. This is perhaps not surprising for households with a member who has chosen to take an environment course. It has been roughly estimated that a household footprint of about 0.63 ha per person would required to live equitably within the bio-productive land area available in the world (Wackernagel and Rees, 1996, Simmons and Chambers, 1998). It is encouraging that nearly a quarter (24%) of the OU households had a footprint of 0.63 ha or less per person. However, this means that over three-quarters of these households needed to reduce their footprints in order to move towards global sustainability.

At the end of the course a sample of 206 students completed an environmental audit questionnaire containing a number of questions about their patterns of consumption, any changes in their behaviour and attitudes towards the environment. For example the following two questions were asked:

- As a result of taking the T172 course have your general household patterns of travel changed in any way?
- As a result of taking the T172 course have your attitudes towards the environment changed?

A number of students mentioned changes in their travel patterns such as:
'We try to walk or use public transportation when we can.'
'I now cycle to work.'
'Have scrapped our 2nd vehicle and use public transport or walk instead.'
'Cut down on unnecessary journeys - better planning.'
'Car sharing as a result of the course. Also bicycle bought and used on warmer days.'
'Moved house to reduce travel to and from work'

Attitudes similarly did seem to change with views and actions expressed such as:
'Better awareness of how my lifestyle can affect the environment, discussing their effects with friends and family to raise their awareness.'
'I am always more conscious now of the effect any of my actions may have on the environment.'
'Just made me more aware of the issues.'
'Doing all I can in energy reduction. Staying away from using non-renewable energy resources as much as possible.'

For some it was the realisation of the complexity of the issues or a deeper understanding:
'Realisation of the scale and complexity of trying to change human behaviour and environmental problems.'
'I'm more aware of the complexity of caring for the environment and now wish to work in this field.'
'I'd already realised that the care of the environment was becoming a big issue. This was one of the reasons for taking this course in the first place, but studying a little deeper helped me become more aware and gave more depth.'
'I don't think my ideas have changed, simply strengthened and widened.'

In addition there were comments for the course team and the Open University about the resources used in producing the course materials themselves that need to be considered such as:
'There was a considerable amount of material supplied. Folders that could have been sourced by me. The course material used expensive paper and a lot of it.'

Conclusion
Overall the use of an activity such as EcoCal focussed on students' lifestyles was very popular. The Ecological Footprints produced were comparable with those of other studies in the UK and showed significant differences between the profiles for rural and urban households and between the profiles for households with and without children. From the student questionnaire responses there was evidence that studying the course had raised students awareness and understanding of environmental issues. There had been discussion of environmental issues within households that in many cases prompted changes in behaviour.

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